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AQUATIC ANGIOSPERMS OF JAUNPUR

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ABSTRACT

The present paper deals with an investigation of aquatic angiosperms of Jaunpur District. Geography, climate and ecological classification of the species along with diagnostic features and phenology are described. In all, 127 species representing 91 genera and 44 families have been recorded.

INTRODUCTION

Northern part of the Indian subcontinent has by and large a subtropical climate. A major portion of precipitation comes in the form of rainfall and is restricted to the rainy season (June-September), besides some winter showers. This large amount of rainfall during rains results in several temporary ponds, ditches and rivulets. In addition, this downpour causes a considerable increase in the water-level of perennial water-reservoirs *e.g.* lakes, rivers and nullahs etc. All these provide an ideal habitat for the growth of aquatics, ranging from phytoplankton to angiosperms.

Taxonomic studies of aquatic angiosperms have been undertaken in the past by Biswas and Calder (1937), Mirashi (1954, 1957, 1958), Kachroo (1956), Pattanaik and Patnaik (1956), Chavan and Sabins (1961), Seerwani (1962) and Subramanyam (1962). Except a few (Misra, 1944; Sen, 1959; Sahai and Sinha, 1968) little attention has been paid by earlier workers to the study of aquatics in Uttar Pradesh.

This communication incorporates the author's observations on the taxonomic and ecological behaviour of aquatic and swampy vegetation of Jaunpur district (Eastern Uttar Pradesh). It includes diagnostic features, phenology and field numbers of the species. Herbarium specimens have been deposited in the Herbarium, Botany Department, University of Gorakhpur, Gorakhpur.

GEOLOGY AND CLIMATE

District Jaunpur is located in the Eastern part of Uttar Pradesh, in Varanasi Division. It is surrounded by Ghazipur district in the east, Pratapgarh and Allahabad in West, Faizabad and Azamgarh in north and Allahabad and Varanasi districts in South. The geographical limits are 25°36′ and 26°19′ North Latitude and 82°15′ and 83°15′ East Longitude, at an elevation of 81.7 meters above the sea-level.

The average annual rainfall is 108 cm. However, in 1971, this was approximately 126 cm. The monsoon commences during the later part of June and comes to an end in September but may, sometimes, continue till October. Usually long and dry weather prevails from October to May with scanty winter showers (to an average of 6 cm in December and 23.2 cm in January). November to early March are the cold months. The hot weather which commences in March lasts till the onset of rains. Annual average maximum temperature is 33°C, the minimum being 21°C. The minimum temperature goes down to 10°C in the month of January while the maximum rises upto 41°C in May.

Soil of the area is generally alluvial. Its texture is sandy in areas south of the Gomti river, loamy in Shahganj tehsil and clayey in the rest parts. General surface is plane and slopy towards south-east. Undulation is characteristic to the courses of rivers and rivulets.

A large number of perennial water-bodies are characteristic of the area. Lakes like Gujara and Minag in Shahganj tehsil and Arre Barre in Jaunpur tehsil, rivers like Gomti and Sai; nullahs like Gathia, Golwa and Jogiapur etc. deserve mention. Also a large number of shallow depressions have been found, which become swampy during and after the rains. Plants enumerated here have been collected from these localities.

ECOLOGICAL CLASSIFICATION

Following Daubenmire (1947) the aquatic angiosperms of the district can be grouped into following categories:

1. *Floating hydrophytes*: These are in contact with water and air only and are commonly represented by *Eichhornia crassipes* (Mart.) Solms, *Pistia stratiotes* Linn., *Trapa bispinosa* Roxb., *Wolffia arrhiza* (Linn.) Wimm. etc.

2. *Suspended hydrophytes*: These are rootless, submerged hydrophytes that are in contact with water only. Main constituents of this category are: *Ceratophyllum demersum* Linn., *Utricularia aurea* Lour., *U. inflexa* Forsk. var. *stellaris* (Linn. f.) Tayl. etc.

3. *Submerged anchored hydrophytes*: These are, entirely or for the most part, in contact with soil and water only. Common plants in this category are: *Hydrilla verticillata* (Linn. f.) Royle, *Potamogeton pectinatus* Linn., *Ottelia alismoides* (Linn.) Pers., *Vallisneria spiralis* Linn. etc.

4. *Floating leaved anchored hydrophytes*: These are in contact with soil, water as well as air. The common plants are: *Aponogeton natans* (Linn.) Engl. & Kraus, *Nelumbo nucifera* Gaertn., *Nymphaea nouchali* Burm. f., *N. stellata* Willd., *Nymphoides cristatum* (Roxb.) O. Kuntze, *N. indicum* (Linn.) O. Kuntze etc.

5. *Floating shoots anchored hydrophytes*: These are rooted in the muddy substratum with their shoots floating on the water surface and are in contract with soil, water and air. The common plants are: *Ipomoea aquatica* Forsk., *Ludwigia adscendens* (Linn.) Hara, *Neptunia prostrata* (Lamk.) Baill. etc.

During dry months when water recedes plants of this category become terestrial with their reduced leaves and stems.

6. *Emergent anchored hydrophytes*: The root, the lower part of the stem and often the lower leaves of these are usually submerged in water. Some of the characteristic species are: *Achyranthes aquatica* Br., *Aeschenomene indica* Linn., *Amischophacellus axillaris* (Linn.) Rolla Rao and Kamam., *Ammania baccifera* Linn., *Bergia ammannioides* Roxb., *Coix lachryma-jobi* Linn., *Cyperus difformis* Linn., *Eleocharis dulcis* Henschel., *Eriocaulon quinquangulare* Linn., *Hydrolea zeylanica* Vahl, *Limnophila indica* Drucé, *Polygonum glabrum* Willd., *P. limbatum* Meissn., *Sphenoclea zeylanica* Gaertn., *Scirpus articulatus* Linn., *Tenagocharis latifolia* (D. Don) Buchen. etc.

7. *Wetland hydrophytes*: In this category the soil is usually saturated with water at least in the early part of life. The prominent plants are: *Canscora decussata* Roem. & Schult., *C. diffusa* R. Br., *Corchorus capsularis* Linn., *Cyperus alulatus* Kern, *C. exaltatus* Retz., *Eleocharis atropurpurea* Kunth, *Fimbristylis miliacea* Vahl, *Glossostigma spathulatum* Arn. ex Benth. *Gnaphalium pulvinatum* Del., *Hygrophila auriculata* Heine, *Melochia corchorifolia* Linn., *Microcarpaea minima* (Koen.) Merr., *Phyla nodiflora* Greene, *Ranunculus sceleratus*

Linn. *Rumex dentatus* Linn., *Xanthium strumarium* Linn. etc.

TAXONOMIC DATA

	Dicots	Monocots	Total
Families	29	15	44
Genera	51	40	91
Species	68	59	127

Ratio between families of Monocots and Dicots =1 : 1.9
Ratio between genera of Monocots and Dicots =1 : 1.2
Ratio between species of Monocots and Dicots =1 : 1.15

The dominant families of the area in order of the number of their species are Gramineae (19), Cyperaceae (19), Compositae (9) and Scrophulariaceae (8).

New Records: The following species collected during the course of this investigation are not reported in the flora of Upper Gangetic Plain by Duthie (1960).

Achyranthes aquatica Br., *Aponogeton natans* (Linn.) Engl. & Kraus, *Chenopodium ambrosioides* Linn., *Cyperus alulatus* Kern, *Eichhornia crassipes* (Mart.) Solm, *Microcarpaea minima* (Koen.) Merr.

ENUMERATION

RANUNCULACEAE

Ranunculus sceleratus Linn.

An erect, glabrous annual with radical, long-petiolate leaves and yellow flowers. Common along river banks. Fls. & Frts.: Jan.-May ; *O. P. Singh* 1667.

NYMPHAEACEAE

Nelumbo nucifera Gaertn.

A large aquatic herb with milky juice and peltate leaves. Flowers white. Abundantly found in Gujara tal. Fls. & Frts.: Aug.-Oct. ; *S. K. Singh* 1501.

Nymphaea nouchali Burm. f.

A floating herb with dentate, sagittate leaves and white flowers. Fls. & Frts.: Sept.-Oct. ; *S. K. Singh* 1502.

N. stellata Willd.

A floating herb. Leaves orbicular, entire, purplish beneath. Flowers white. Fls. & Frts.: Sept.-Oct.; *S. K. Singh* 1505.

ELATINACEAE

Bergia ammannioides Roxb.

An erect hairy herb with linear-lanceolate, serrate leaves and red flowers in dense axillary fascicles. Fls. & Frts.: Oct.-April ; *S. K. Singh* 1670.

STERCULIACEAE

Melochia corchorifolia Linn.

A much branched erect herb with pinkish flowers arranged in terminal axillary clusters. Fls. & Frts.: Aug.-Oct. ; *S. K. Singh* 1675.

Pentapetes phoenicia Linn.

An erect herb with scarlet flowers. Fls. & Frts.: Sept.-Oct. ; *S. K. Singh* 1968.

TILIACEAE

Corchorus capsularis Linn.

An erect glabrous annual with ovate lanceolate leaves and yellow flowers. Capsule globose, muricated. Fls. & Frts.: Sept.-Nov. ; *S. K. Singh* 1665.

PAPILIONACEAE

Aeschynomene aspera Linn.

A stout marsh herb with floating spongy stem and yellow flowers. Pods warted or muricate on the faces. Fls. & Frts.: Oct.-Nov. ; *S. K. Singh* 1503.

A. indica Linn.

An erect annual herb upto 55 cm. Flowers yellow. Pods linear, jointed, glabrous. Fls. & Frts.: Aug.-Nov. ; *S. K. Singh* 1665.

MIMOSACEAE

Neptunia prostrata (Lamk.) Baill.

An aquatic herb with stout, floating stem rooting at the nodes. Flowers in heads, yellow. Pods obliquely oblong, beaked, 6-8 seeded. Fls. & Frts.: Sept.-Dec. ; *S. K. Singh* 1548.

ROSACEAE

Potentilla supina Linn.

A prostrate, leafy annual herb with yellow flowers. Fls. & Frts.: Jan.-May ; *O. P. Singh* 1664.

LYTHRACEAE

Ammania baccifera Linn.

An erect glabrous herb with reddish flowers in axillary fascicles. Fls. & Frts.: Aug.-Jan.; *S. K. Singh* 1544.

Ammania multiflora Roxb.

An erect herb with quadrangular branches and reddish flowers in peduncled cyme. Fls. & Frts.: Aug.-Dec.; *O. P. Singh* 1655.

Rotala indica (Willd.) Koehne

An erect or decumbent herb with rooting stem. Flowers sessile. Fls. & Frts.: Sept.-Jan.; *S. K. Singh* 1655.

R. rotundifolia Koehne

A prostrate herb rooted at the nodes. Flowers pinkish in simple or panicled spike. Fls. & Frts.: Oct.-Feb.; *S. K. Singh* 1656.

ONAGRACEAE

Ludwigia adscendens (Linn.) Hara

A prostrate aquatic herb with white flowers and cylindrical capsule. Fls. & Frts.: Sept.-Nov.; *O. P. Singh* 1657.

L. perennis Linn.

An erect glabrous herb with yellow flowers. Fls. & Frts.: Nov.-Dec.; *S. K. Singh* 1506.

TRAPACEAE

Trapa bispinosa Roxb.

A floating aquatic herb with white flowers. Commonly cultivated in ponds for its edible fruits. Fls. & Frts.: Sept.-Oct.; *O. P. Singh* 1662.

RUBIACEAE

Dentella repens (Linn.) Forst.

A small prostrate herb rooted at the nodes. Flowers white, solitary axillary. Capsule hairy, crowned by the persistent calyx-lobes. Fls. & Frts.: Almost throughout the year; *S. K. Singh* 1663.

Oldenlandia paniculata Linn.

An erect glabrous annual herb. Flowers white in axillary and terminal cyme. Fls. & Frts.: Oct.-April; *S. K. Singh* 1661.

COMPOSITAE

Caesulia axillaris Roxb.

A glabrous, erect or procumbent herb. Heads homogamous, axillary, purplish-white. Flrs. & Frts.: Sept.-Apr.; *S. K. Singh* 1658.

Centipeda minima (Linn.) A. Br.

A small prostrate glabrous herb. Heads disciform, yellow. Abundantly found in river beds, chiefly associated with *Grangea maderaspatana* Poir, *Potentilla supina* Linn. Fls. & Frts.: Nov.-Mar.; *S. K. Singh* 1660.

Eclipta prostrata Linn.

An erect or prostrate, rough annual herb. Heads white. Fls. & Frts.: Almost throughout the year; *S. K. Singh* 1550.

Gnaphalium indicum Linn.

A slender herb with linear-obovate or spathulate leaves and yellowish-brown heads. Fls. & Frts.: Dec.-Apr.; *S. K. Singh* 1562.

G. pulvinatum Del.

A small, cottony, prostrate, annual herb. Heads yellowish. Fls. & Frts.: Nov.-Apr.; *O. P. Singh* 1654.

Grangea maderaspatana Poir.

A prostrate, pubescent annual herb, forming circular patches. Heads yellow. Fls. & Frts.: Feb.-Apr.; *S. K. Singh* 1653.

Pulicaria crispa Benth.

A densely branched, white-cottony herb. Heads of yellow flowers. Fls. & Frts.: Jan.-Apr.; *S. K. Singh* 1568.

Sphaeranthus indicus Linn.

A viscous pubescent strongly-scented herb. Flowers purplish or pinkish in densely packed heads. Fls. & Frts.: Jan.-Apr.; *S. K. Singh* 1567.

Xanthium strumarium Linn.

An undershrub 80 cm high with hispidulous stem and long-petioled, ovate, triangular, dentate leaves. Heads in terminal and axillary racemes. Fruiting involucres ovoid, covered with hooked prickles. Fls. & Frts.: Dec.-June; *O. P. Singh* 1563.

CAMPANULACEAE

Campanula colorata Wall. ex Roxb.

An erect hispid herb upto 35 cm high with linear-oblong leaves and purplish flowers. Fls. & Frts.: Feb.-Apr.; *S. K. Singh* 1652.

Wahlenbergia marginata (Thunb.) DC.

A perennial, erect or decumbent herb with linear-oblong leaves and yellowish flowers. Fls. & Frts.: Jan.-May; *S. K. Singh* 1565.

SPHENOCLEACEAE

Sphenoclea zeylanica Gaertn.

An annual erect herb with alternate leaves and small. Flowers greenish-yellow in cylindrical or conical capitate spikes. Fls. & Frts.: Sept.-Nov.; *S. K. Singh* 1552.

PRIMULACEAE

Androsace umbellata (Lour.) Mew

A delicate little annual herb with suborbicular, cordate, serrate leaves and white flowers. Fls. & Frts.: Jan.-Mar.; *S. K. Singh* 1564.

GENTIANACEAE

Canscora decussata R. & S.

An erect glabrous annual with quadrangular decussate branches. Flowers white, calyx winged. Fls. & Frts.: Aug.-Oct.; *O. P. Singh* 1508.

C. diffusa R. Br.

A slender much branched annual upto 45 cm high. Leaves broadly ovate, 3-nerved. Flowers pink, calyx not winged. Fls. & Frts.: Dec.-Mar.; *O. P. Singh* 1566.

Hoppea dichotoma Willd.

A small glabrous annual upto 12 cm high. Flowers white. Fls. & Frts.: Sept.-Oct.; *S. K. Singh* 1555.

Nymphoides cristatum (Roxb.) O. Kuntze

An aquatic, floating herb rooted at the nodes. Leaves orbicular, deep cordate, purplish and with green veins beneath. Flowers white, with entire corolla lobes. Fls.: Oct.-Feb.; *S. K. Singh* 1509.

N. indicum (Linn.) O. Kuntze

An aquatic, floating herb with orbicular, cordate leaves greenish beneath. Flowers white with yellow centre. Corolla lobes fimbriate, densely papillose. Fls.: Aug.-Nov.; *O. P. Singh* 1510.

HYDROPHYLLACEAE

Hydrolea zeylanica Vahl

An erect, annual herb upto 25 cm high. Flowers blue in terminal raceme. Capsule small, enclosed in the calyx. Fls. & Frts.: Sept.-Oct.; *S. K. Singh* 1511.

BORAGINACEAE

Heliotropium indicum Linn.

A coarse, diffuse, annual herb with lilac flowers in cylindrical helicoid spikes. Fruit deeply 2-lobed. Fls. & Frts.: Oct.-Apr.; *O. P. Singh* 1651.

CONVOLVULACEAE

Ipomoea aquatica Forsk.

An aquatic, trailing herb, rooting at the nodes. Leaves ovate-oblong or hastate. Flowers purplish. Capsule ovoid, glabrous. Fls. & Frts.: Sept.-Feb.; *O. P. Singh* 1512.

SOLANACEAE

Physalis minima Linn.

An erect or decumbent herb with ovate, sinuate-dentate leaves and yellow flowers. Berries enclosed within accrescent, membranous calyx. Fls. & Frts.: Aug.-Nov.; *O. P. Singh* 1636.

SCROPHULARIACEAE

Bacopa monnieri (Linn.) Pennell

A prostrate, sub-succulent herb, rooting at the nodes. Leaves sessile, sphathulate. Flowers pink or purplish-white. Fruit ovoid capsule, glabrous. Fls. & Frts.: Sept.-Dec.; *O. P. Singh* 1639.

Dopatrium junceum Buch.-Ham. ex Benth.

A slender erect herbs with small pink or purplish flowers. Capsule globose. Fls. & Frts.: Aug.-Oct.; *S. K. Singh* 1514.

Glossostigma spathulatum Arn. ex Benth.

A minute creeping herbs with opposite or fascicled narrow entire leaves and bluish-white flowers. Capsule globose. Fls. & Frts.: Oct.-Feb.; *S. K. Singh* 1581.

Limnophila indica (Linn.) Druce

A small, erect herb, 8-12 cm tall. Flowers solitary axillary, white or pinkish. Capsule sub-globose. Fls. & Frts.: Sept.-Feb.; *S. K. Singh* 1515.

Lindernia cordifolia (Colsm.) Merr.

A small diffuse, glabrous, annual herb with white flowers. Capsule linear-lanceolate. Fls. & Frts.: Aug.-Jan.; *S. K. Singh* 1516.

Lindernia crustacea (Linn.) F. Muell.

A small glabrous herb with quadrangular stem and purplish or white flowers. Capsule oblong-ovate. Fls. & Frts.: Aug.-Dec. ; *S. K. Singh* 1647.

Microcarpaea minima (Koen.) Merr.

A very small diffuse or creeping herb and minute, solitary axillary, pinkish-white flowers. Fls.: Nov.-Dec. ; *S. K. Singh* 1648.

Veronica anagallis-aquatica Linn.

An erect, glabrous, herb, 5-55 cm tall stem fistular, cylindrical. Flowers whitish or pinkish in axillary raceme. Capsule compressed, glabrous. Fls. & Frts.: Jan.-Apr. ; *S. K. Singh* 1571.

LENTIBULARIACEAE

Utricularia aurea Lour.

A rootless, suspended aquatic with yellow flowers in erect, aerial racemes. Capsule subglobose. Fls. & Frts.: Sept.-Jan. ; *S. K. Singh* 1517.

U. inflexa Forsk. var. **stellaris** (Linn. f.) Tayl.

A rootless, submerged aquatic herb with yellow flowers. Penduncles with a whorl of 4-5 vescicles. Calyx accrescent. Capsule glo ose. Fls. & Frts.: Oct.-Dec. ; *S. K. Singh* 1649.

ACANTHACEAE

Hemiadelphis polyspermus Nees

A small procumbent herb branching and rooting near the base. Flowers white, in dense, terminal, spikes. Capsule linear-oblong, brown. Fls. & Frts.: Dec.-Apr. ; *S. K. Singh* 1572.

Hygrophila auriculata (Schumach.) Heine

An erect spinous, undershrub ; spines 6, straw-colour. Flowers bluish-purple in sessile axillary whorls. Capsule linear-oblong. Fls. & Frts.: Oct.-Jan. ; *S. K. Singh* 1518.

VERBENACEAE

Phyla nodiflora (Linn.) Greene

A prostrate herb with opposite, serrate leaves. Flowers white in capitate spikes. Fls.: Almost throughout the year ; *S. K. Singh* 1520.

AMARANTHACEAE

Achyranthes aquatica Br.

A tall, stout, aquatic herb upto 1.5 m high with linear-lanceolate leaves. Flowering spikes 15-40 cm long, villous. Fls. & Frts.: Sept.-Dec. ; *O. P. Singh* 1521.

Alternanthera paronychoides St. Hil

A prostrate herb, rooting at the nodes. Flowers white. Fls. & Frts.: Almost throughout the year. *O. P. Singh* 1573.

A. sessilis (Linn.) DC.

A prostrate, glabrous herb, rooting at the nodes, with linear-oblong leaves. Flowers small in axillary fasicles, pinkish or white. Fls. & Frts.: July-Feb. ; *O. P. Singh* 1584.

Amaranthus gracilis Desf.

An erect, glabrous annual with ovate o rhomboid leaves and pale green flowers. Fls. & Frts.: July-Feb. ; *O. P. Singh* 1588.

A. tenuifolius Willd.

A glabrous, annual herb, branches many from the root. Flowers in axillary clusters. Fls. & Frts.: Apr.-Sept. ; *O. P. Singh* 1581.

CHENOPODIACEAE

Chenopodium ambrosioides Linn.

An erect strongly foetid-smelling undershrub. Flowers greenish in small fascicles. Seed brown, polished, smooth. Fls. & Frts.: Feb.-May ; *O. P. Singh* 1574.

POLYGONACEAE

Polygonum barbatum Linn. sub. sp. **gracile** Danser

An erect glabrous annual, 50-115 cm high with linear or elliptic-oblong leaves and white flowers. Nutlets trigonous, shining. Fls. & Frts.: Aug.-Apr. ; *O. P. Singh* 1523.

P. glabrum Willd.

An erect glabrous annual. Leaves lanceolate. Flowers pink, in terminal panicles. Fls. & Frts.: Aug.-Apr. ; *O. P. Singh* 1575.

P. limbatum Meissn.

A tall stout strigosely hairy herb upto 1.5 m high. Leaves lanceolate hispid on both surfaces. Flowers white. Nut orbicular, biconvex, black, polished. Fls. & Frts.: Sept.-Feb. ; *S. K. Singh* 1624.

Polygonum plebeium R. Br.

A prostrate, diffusely branched, glabrous herb with linear-oblong leaves and pinkish flowers. Fls. & Frts.: Aug.-May ; *O. P. Singh* 1576.

Rumex dentatus Linn.

An erect, glabrous annual with radical leaves and greenish flowers in verticillate clusters. Nutlets 3-gonous, brown. Fls. & Frts.: Jan.-June ; *O. P. Singh* 1576.

CERATOPHYLLACEAE

Ceratophyllum demersum Linn.

A slender, rootless, much-branched aquatic. Flowers monoecious, solitary, axillary. Fruit achene with basal spine and apical persistent base of the style. Fls. & Frts.: Sept.-Nov. ; *O. P. Singh* 1589.

HYDROCHARITACEAE

Hydrilla verticillata (Linn. f.) Royle

A delicate, much branched aquatic herb with opposite or whorled, sessile, linear, oblong, entire or serrulate leaves and minute, pedicellate male flowers and sessile female flowers. Fls.: Sept.-Nov. ; *S. K. Singh* 1525.

Ottelia alismoides (Linn.) Pers.

A succulent, submerged aquatic with radical, oblong or ovate, lanceolate leaves. Flowers white. Fruits ellipsoid, crowned by the persistent perianth segments. Fls. & Frts. : Sept.-Dec. ; *S. K. Singh* 1526.

Vallisneria spiralis Linn.

A small, tufted herb with radical, ribbon-shaped, leaves. Male flowers minute, in an ovoid, 3-lobed shortly peduncled spathe ; female flowers solitary, on a very long, spiral stalk. Fls. & Frts.: Aug.-Dec. ; *S. K. Singh* 1556.

AMARYLLIDACEAE

Crinum defixum Ker-Gawl

A stout, leafy, bulbous herb with linear-lanceolate leaves 25-60 cm long and white flowers. Fruits sub-globose. Fls. & Frts.: Aug.-Nov. ; *O. P. Singh* 1640.

PONTEDERIACEAE

Eichhornia crassipes (Mart.) Solms

A floating aquatic, profusely rooting at the nodes. Leaves spathulate, petioles swollen into green bladders. Flowers violet-blue, in spikes. Fls.: Sept.-Nov. ; *O. P. Singh* 1557.

Monochoria hastata (Linn.) Solms

An aquatic perennial herb with creeping root stock and sagittate, hastate or cordate leaves. Flowers purplish-blue. Capsule ellipsoid. Fls. & Frts.: July-Nov. ; *O. P. Singh* 1641.

COMMELINACEAE

Amischophacelus axillaris (Linn.) Rolla Rao & Kamm.

A glabrous, creeping and rooting annual herb. Flowers pinkish-blue, capsule oblong-ellipsoid, beaked. Fls. & Frts.: July-Dec. ; *O. P. Singh* 1558.

Commelina benghalensis Linn.

An annual herb with elliptic-ovate leaves and blue flowers. Capsule pyriform, membranous. Fls. & Frts.: July-Nov. ; *O. P. Singh* 1643.

Murdania nudiflora (Linn.) Brenan

A prostrate or sub-scandent herb rooting at the nodes. Flowers bluish or purple. Stamens 2. Capsule sub-globose, 3-celled. Fls. & Frts.: Aug.-Nov. ; *O. P. Singh* 1559.

JUNCACEAE

Juncus bufonius Linn.

A slender, tufted herb upto 15 cm high. Flowers yellowish green. Common in moist places. Fls. & Frts.: Jan.-Mar. ; *O. P. Singh* 1590.

TYPHACEAE

Typha angustata Bory & Chaub.

A tall bull rush upto 2 m high with yellowish brown flowers arranged in cylindrical spikes. Common in marshy areas. Fls.: Oct.-Apr. ; *O. P. Singh* 1580.

ARACEAE

Pistia stratiotes Linn.

A floating, stemless, gregarious tufted aquatic herb with obovate-cuneate leaves and yellowish flowers. Met with in ponds. Fls.: Feb.-May. ; *S. K. Singh* 1610.

Spirodella polyrhiza Schleid.

A small herb with ovate or orbicular, herbaceous fronds, dark green above, purplish beneath and numerous roots, common in stagnant waters of ponds. *O. P. Singh* 1591.

Wolffia arrhiza Wimm.

A very minute, granular, floating plants with subglobose, ovate fronds without roots. Frequently found in ponds and ditches. *O. P. Singh* 1644.

ALISMATACEAE

Sagittaria sagittifolia Linn.

An erect aquatic herb. Flowers white with purple base. Achenes obliquely ovate, with broad entire or subcrenate wings. Fls. & Frts.: Oct.-Feb. ; *O. P. Singh* 1561.

BUTOMACEAE

Tenagocharis latifolia (D. Don) Buchen.

A scapigerous, marsh herb. Flowers white. Commonly found in rice fields. Fls.: Sept.-Nov.; *S. K. Singh* 1539.

APONOGETONACEAE

Aponogeton crispum Thunb.

A scapigerous aquatic herb with lanceolate leaves and white flowers. Abundantly found in Gujara and Minag lake. Fls.: Sept.-Nov.; *O. P. Singh* 1535.

A. natans (Linn.) Engl. & Kraus

A floating, scapigerous, aquatic herb. Flowers bluish-purple in cylindrical spikes. Common in ditches. Fls. & Frts.: Aug.-Nov.; *S. K. Singh* 1536.

POTAMOGETONACEAE

Potamogeton crispus Linn.

A slender, submerged aquatic herb. Leaves linear-oblong crisped, sessile. Flowers small greenish. Fruits oblique-ovoid. Common in ponds. Fls. & Frts.: Dec.-Mar. ; *O. P. Singh* 1611.

P. pectinatus Linn.

A filliform, grass-like, aquatic herb. Flowers in distant whorls. Fruits oblique, hardly keeled. Abundantly found on the margins of ponds. Fls. & Frts.: Dec.-Mar. ; *O. P. Singh* 1537.

ERIOCAULACEAE

Eriocaulon quinquangulare Linn.

A caespitose herb with radical rosette leaves and white, globose heads. Very common in swampy and rice fields. Fls. & Frts.: Oct.-Feb. ; *S. K. Singh* 1612.

CYPERACEAE

Bulbostylis barbata (Rottb.) Clarke

A tufted filiforms sedge with dark brown spikelets. Very common in wet sandy places. Fls. & Frts.: Jan.-Mar. ; *S. K. Singh* 1631.

Cyperus alulatus Kern

A tufted sedge with golden spikelets. Abundantly found in drying ditches and rice fields, associated with *Cyperus iria* Linn. Fls. & Frts.: Aug.-Oct. ; *O. P. Singh* 1540.

C. brevifolius (Rottb.) Hassk.

A perennial sedge with horizontal rhizome. Spikes globose, green. Fls. & Frts.: Mar.-Nov.; *O. P. Singh* 1617.

C. compactus Retz.

A handsome sedge with brown spikelets aggregated in round star like spikes. Fls. & Frts.: Aug.-Oct. ; *O. P. Singh* 1618.

C. corymbosus Rottb.

A robust sedge with dark brown spikelets. Commonly found in rice fields and in moist situations; growing along with *Cyperus exaltatus* Retz., *Polygonum glabrous* Willd. Fls. & Frts.: Sept.-Jan. ; *S. K. Singh* 1619.

C. difformis Linn.

A tufted sedge with greenish spikelets. Fls. & Frts.: Aug.-Nov.; *O. P. Singh* 1645.

C. exaltatus Retz.

A handsome sedge up to 1.5 m long with straw coloured spikelets. Fls. & Frts.: Aug.-Oct. ; *O. P. Singh* 1620.

C. iria Linn.

A tufted annual sedge with greenish-yellow. Spikelets arranged in compound umbel. Fls. & Frts.: Aug.-Oct.; *S. K. Singh* 1621.

C. laevigatus Linn.

A perennial sedge with creeping rhizome. Spikelets in lateral heads. Fls. & Frts.: Sept.-Feb.; *S. K. Singh* 1542.

Eleocharis atropurpurea (Retz.) Kunth

A small caespitose sedge. Common weeds

of rice fields. Fls. & Frts.: Apr.-Dec. ; *S. K. Singh* 1545.

Eleocharis dulcis (Burm. f.) Henschel.

A rush like tall sedge with brownish spikelet elongated at the apex. Commonly found in ditches and tals, associated with *Eleocharis palustris* (L.) R. Br. Fls. & Frts.: Jan. ; *O. P. Singh* 1547.

E. palustris (Linn.) R. Br.

A slender, caespitose sedge with black creeping rhizome. Common in shallow waters. Fls. & Frts.: Dec.-Mar. ; *O. P. Singh* 1543.

Fimbristylis aestavilis (Retz.) Vahl

A small tufted sedge. Found in drying ditches and along the embankments of tals, chiefly associated with *Fimbristylis ferruginea* Vahl. Fls. & Frts.: May-July ; *O. P. Singh* 1622.

F. diphylla (Retz.) Vahl

A caespitose sedge. Very common in drying ditches. Fls. & Frts.: Aug.-Nov. ; *O. P. Singh* 1523.

F. ferruginea Vahl

A tall sedge with ovoid, dark-brown spikelets. Commonly found on the embankments of rice-fields. Fls. & Frts.: July-Oct. ; *S. K. Singh* 1525.

F. miliacea (Linn.) Vahl

A caespitose annual, leafy at the base with ellipsoid-lanceolate spikelets. Abundantly found in rice-fields, chiefly associated with *Fimbristylis diphylla* (Retz.) Vahl, and *Cyperus alulatus* Kern. Fls. & Frts.: Aug.-Nov. ; *S. K. Singh* 1544.

Scirpus articulatus Linn.

A caespitose, fistular sedge, septate when dry. Spikelets in dense lateral head below the middle half. Common in muddy places. Fls. & Frts.: Nov.-Feb.; *S. K. Singh* 1541.

S. erectus Poir

A tufted, slender, terete sedge. Spikelets 1-5 in a single lateral head near the apex of the stem. Very common in rice fields. Fls. & Frts.: Dec.-Feb.; *S. K. Singh* 1546.

S. supinus Linn.

A tufted sedge spikelets in a single lateral head near the apex of stem. Bristles absent. Very common in marshy places. Fls. & Frts.: Dec.-Mar. ; *O. P. Singh* 1625.

GRAMINEAE

Brachiaria ramosa (Linn.) Stapf

An annual with erect or ascending stems, upto 60 cm high, spikelets alternate, 3 × 2 mm, ovoid. Commonly found in waste moist places. Fls. & Frts.: June-Oct. ; *S. K. Singh* 1593.

Coix lachryma-jobi Linn.

An annual grass. Commonly found in moist localities near ponds and in rice fields. Fls. & Frts.: Sept.-Nov. ; *O. P. Singh* 1627.

Dactyloctenium aegyptium (Linn.) Beauv.

An erect or decumbent annual. Spikes 2-6, digitately radiating, greenish. Commonly found in rice-fields. Fls. & Frts.: Aug-Nov. ; *O. P. Singh* 1627.

Digitaria adscendens (H. B. & K.) Henr.

An erect or decumbent, annual grass. Spikes 2 or more floral glume densely bearded with soft white spreading hairs. Abundantly found along the margin of rice fields. Fls. & Frts.: Aug.-Nov. ; *O. P. Singh* 1598.

Echinochloa colonum (Linn.) Link.

An annual grass. Spikes 8-20, sessile. Common in rice fields, near ponds, ditches. Fls. & Frts.: July-Nov. ; *O. P. Singh* 1630.

E. crus-galli (Linn.) Beauv.

An annual grass. Spikes 3-4, spikelets cuspidate or awned. Commonly found in ditches and in moist places. Fls. & Frts.: July-Nov. ; *O. P. Singh* 1601.

Eleusine indica (Linn.) Gaertn.

An erect annual. Spikes 2-7 digitate. Found along the margin of ditches. Fls. & Frts.: July-Oct.; *O. P. Singh* 1597.

Eragrostis tenella (Linn.) Roem. & Schult.

A tufted annual grass. Common in moist places along the nullahs and ditches. Fls. & Frts.: Aug.-Dec.; *S. K. Singh* 1629.

E. tremula Hochst. ex Steud.

A tufted, erect or ascending annual.

Spikelets linear, white. Abundantly found on moist sandy soil along the river bank. Fls. & Frts.: Aug.-Nov.; *S. K. Singh* 1632.

Hemarthria compressa (Linn. f.) R. Br.

A hydrophilous, perennial grass. Commonly found along the banks of ditches and also in rice fields. Fls. & Frts.: July-Sept.; *S. K. Singh* 1635.

Hygrorhiza aristata (Retz.) Nees ex Wight & Arn.

An aquatic floating grass with green whorled feathery roots, spongy stems and inflated leaf sheaths. Spikelets 1-flowered. Commonly found in lakes and ponds. Fls. & Frts.: Oct.-Nov.; *S. K. Singh* 1605.

Imperata cylindrica (Linn.) Beauv.

An erect, perennial grass. Inflorescence a silvery white. Very common along nullahs. It gives beautiful appearance due to its silvery inflorescence. Fls. & Frts.: July-Oct.; *O. P. Singh* 1637.

Leptochloa panicea (Retz.) Ohwi

An annual, ascending, slender grass. Common on moist sandy soil along nullahs. Fls. & Frts.: July-Sept.; *S. K. Singh* 1604.

Oplismenus burminii (Retz.) Beauv.

A prostrate or decumbent, slender annual grass. Abundantly found on moist soils along 'Gathia nullahs' Fls. & Frts.: July-Dec.; *O. P. Singh* 1638.

Paspalum distichum Linn.

A common grass of the area, found along the ponds and ditches. Fls. & Frts.: July-Sept.; *O. P. Singh* 1603.

P. scrobiculatum Linn.

A glabrous annual grass. Abundantly found as a weed of paddy crop fields. Fls. & Frts.: Aug.-Jan.; *S. K. Singh* 1642.

Perotis indica (Linn.) Kuntze

An erect, tufted grass with purplish-violet spike. Involucral glume long-awned. Abundantly found in moist sandy soil along the river banks. The plant was seen chiefly associated with *Eragrostis tremula* Hochest. ex Steud. Fls. & Frts.: Sept.-Nov.; *S. K. Singh* 1606.

Phragmites maxima (Forsk.) Blatt. & McC.

A tall perennial grass with a creeping rhizome. Inflorescence a large decompound panicle, silky hairy at the base. Chiefly found in marshy places, associated with *Achyranthes aquatica* Br. and *Polygonum glabrum* Willd. etc. Fls. & Frts.: Dec.-Feb.; *O. P. Singh* 1607.

Rottboellia exaltata Linn. f.

A perennial grass. Frequently found along the lakes and in rice fields. Fls. & Frts.: Aug.-Nov.; *O. P. Singh* 1614.

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